MSDS No.- S-39-01 (Revision. -B)

MATERIAL SAFETY DATA SHEET

SECTION 1- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer Name- Tadiran Batteries Ltd., P. O. Box 1, Kiryat Ekron, Israel 70500.

US office address- 2 Seaview Blvd. Port Washington NY 11050

Emergency Telephone No. – CHEMTREC: 1-800-424-9300
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Tel. for information 972-8-944-4503

Products Name: Primary, (Non-rechargeable) Lithium Sulfuryl Chloride (Li/SO_2Cl_2) cells and batteries. This MSDS covers the the TL, 3.9V series and the batteries assembled from them. Cells sizes covered by this MSDS are: TL-6902, TL-6903, TL-6955, TL-6920, TL-6930, and TL-6937, with all their finishing versions and batteries assembled from them.

SECTION 2- COMPOSITION, INFORMATION ON INGREDIENTS

Each cell consists of hermetically sealed metallic container (nickel plated steel) containing a number of chemical and materials. Below are the mchemials which could be potentially hazardeous upon release from the cell on abuse. Quantities of chemicals vary upon cell size.

Ingredient Name	CAS #	%	ACGIH (TLV)	OHSA (PEL)
Lithium Metal (Li)	7439-93-2	4-6%	N/A	N/A
Sulfuryl Chloride (SO_2Cl_2)	7791-25-5	3-5%	N/A	N/A
Thionyl Chloride ($SOCl_2$)	7719-09-7	35-45%	**1** ppm ($5\ mg/M^3$)	$5\ mg/m^3$
Carbon (C)	1333-86-4	3-6%	$3.5\ mg/m^3$	$3.5\ mg/m^3$
Aluminum Chloride ($AlCl_3$)	7446-70-0	4-6%	$2\ mg/m^3$ (Al salt, soluble)	

SECTION 3 - HAZARD IDENTIFICATION

The lithium Sulfuryl Chloride cells described in this MSDS are hermetically sealed units, which do not cause hazard when used according to the recommendations of the manufacturer.

Under normal condition of use of the cells, the materials and the liquid electrolyte they contain, are non-reactive provide that their integrity is maintained. Risk of exposure exists only in case of mechanical, electrical or thermal abuse. Thus the cells should not be short circuited, recharged, punctured, incinerated, immersed in water, force-discharged, or expose to temperatures above the temperature range of the cell or battery. In these cases there is risk of fire or explosion. If cell or battery leaks, then:

Primary Route of Entry: Inhalation

Potential Acute Health Hazards Effects: Vapors are very irritating mucous membranes of eyes, mouth and respiratory tract. Skin Contact may produce burns.

Inhalation of vapors or spray of mist of Sulfuryl Chloride and Thionyl Chloride can cause severe irritation of respiratory tract, characterized by coughing, chocking or shortness of breath. Inflammation of eye is characterized by redness, watering and itching. Skin inflammation is characterized by itching, scaling, reddening or blistering. Ingestion may cause severe damage to the digestive tract.

Potential Chronic Health Hazards: Hazardous in case of skin contact (corrosive, irritant, sensitizer), of eye contact (irritant), of ingestion, or inhalation. Repeated or prolonged contact with spray mist or vapors may produce chronic eye irritation or severe skin irritation. Repeated or chronic exposure to vapors may produce respiratory tract irritation leading to pulmonary edema or chronic respiratory irritation.

Carcinogenic Effects: Not available

Mutagenic Effects: Not available

Teratogenic Effects: Not available

SECTION 4- FIRST AID MEASURES

In case of battery rupture, explosion, or major leakage, evacuate personnel from contaminated area and provide good ventilation to clear out corrosive fumes, gases or the pungent odor.

Eyes – Check for and remove any contact lenses. Do not use an eye ointment. Rinse with plenty of water for 15 minutes and then seek medical attention. Contact results in acidic burns.

Skin - Remove contaminated clothes and rinse skin with plenty of water or shower for 15 min. Avoid hot water and rubbing skin. If burns develop, seek medical attention. Contact results in acidic burns

Inhalation - Remove to fresh air and rest in well-ventilated area, use artificial respiration if needed, and seek medical attention. May result in pulmonary edema.

Ingestion - rinse mouth, ***DO NOT*** induce vomiting, give plenty of water to drink, and seek medical attention.

SECTION 5- FIRE FIGHTING MEASURES

FLASH POINT:	N/A	AUTO-IGNITION:	N/A
FLAMMABLE LIMIT IN AIR	N/A		

EXTINGUISHING MEDIA:

1. Lith- X (Class D extinguishing media) and Dry Lithium Chloride are effective on fires involving a few lithium batteries. If the cells are directly involved in a fire **DO NOT USE:** WATER, SAND, CO_2, HALON, and DRY POWDER OR SODA ASH EXTINGUISHERS. Wear protective breathing apparatus as positive pressure Self-Contained Breathing Apparatus (SCBA) or Air Purifying Respirator (APR).

2. If the fire is in adjacent area and the cells that are either packed in their original containers or unpacked, the fire can be fought based on fueling material, e.g., paper and plastic products. In these cases the use of copious amounts of **cold** water is effective extinguishing media. Storage area may employ sprinkler with cold water.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus to avoid breathing of irritant fumes (NIOSH approved SCBA & full protective equipment). Wear protective clothing and equipment to prevent body contact with electrolyte solution.

Fire may be fought, but only from safe fire-fighting distance. Evacuate all persons from immediate area of fire.

UNUSUAL EXPLOSION AND FIRE EXPLOSION: Battery or cells may explode when subject to: excessive heat (above 150ºC), recharged, over-discharged (discharge below 0V), punctured and crushed. During thermal decomposition generation of chlorine (Cl_2), hydrogen chloride (HCl), Hydrogen (H_2), Sulfuric acid (H_2SO_4) and sulfur dioxide (SO_2) can be formed.

SECTION 6- ACCIDENTAL RELEASE MEASURES

PROCEDURES TO CONTAIN AND CLEAN UP LEAKS OR SPILLS: The material contained within the battery would only be released under abusive conditions.

In the event of battery rapture and leakage: contain the spill while wearing proper protective clothing and ventilate the area. Placed in approved container (after cooling if necessary) and disposed according to the local regulations. Do not breathe vapors or touch liquid with bare hands.

NEUTRALIZING AGENT:

WASTE DISPOSAL METHOD: Evacuate area. Trained person can neutralized spill with sodium carbonate (Na_2CO_3) or 1:1 mixture of soda ash and slaked slime. A NIOSH Approved Acid Gas Filter mask or Self-Contained Breathing Apparatus should be worn. Seal leaking battery and plastic bag with sodium carbonate (Na_2CO_3) or 1:1 mixture of soda ash and slaked slime and dispose of as hazardous waste.

OTHER PRECAUTIONS; Never attempt to disassemble, machine, or otherwise modify cells or batteries or injury may result. For cells that have vented, leaked or exploded, follow North American Emergency Response Guide (NAERG) no. 138.

SECTION 7- HANDLING AND STORAGE

The batteries should not be opened, destroyed or incinerate, since they may leak or rupture and release to the environment the ingredients that they normally contained in the hermetically sealed container.

HANDLING- Do not short circuit terminals, or expose to temperatures above the temperature rating of the battery, over charge the battery, forced over-discharge (voltage below 0.0V), throw to fire. Do not crush or puncture the battery, or immerse in liquids.

STORAGE- Storage preferably in cool (below 30ºC), low humidity and ventilated area, which is subject to little temperature change.

Do not place the battery near heating equipment, nor expose to direct sunlight for long periods. Elevated temperatures can result in shortened battery life and degrade performance.

Keep batteries in original packaging until use and do not jumble them.

Do not store batteries in high humidity environment for long periods.

OTHER- the cells and the batteries are not rechargeable batteries and should not be charged.

Applying pressure and deforming the battery may lead to disassembly followed by eye skin and throat irritation.

Follow manufacturer recommendations regarding maximum recommended current and operating temperature range.

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION

GENERAL- The following safety measures are not necessary in normal use. They need only be applied if there is a risk that, in use or handling, the recommendations, as outlined in Section 3, have not been followed.

RESPIRATORY PROTECTION: In case of abuse and leak of liquid or fumes, use NIOSH approved Acid Gas Filter Mask or Self-Contained Breathing Apparatus.

VENTILATION: In case of abuse, use adequate mechanical ventilation (local exhaust) for battery that vents gas or fumes.

PROTECTIVE GLOVES: In case of spill use PVC or Nitrile gloves of 15 mils (0.015 inch) or thicker.

EYE PROTECTION: Use ANSI approved chemical worker safety goggles or face shield.

OTHER PROTECTIVE EQUIPMENT: In case needed, chemical resistance clothing is recommended along with eye wash station and safety shower should be available meeting ANSI design criteria.

WORK HYGIENIC PRACTICES: Use good chemical hygiene practice. Wash hands after use and before drinking, eating or smoking. Launder contaminated cloth before reuse.

SUPPLEMENTARY SAFETY AND HEALTH DATA: If the battery is broken or leaked the main hazard is the electrolyte. The electrolyte is mainly solution of Aluminum Chloride in Sulfuryl Chloride and Thionyl Chloride.

Fires may be fought but only from safe fire fighting distance, evacuate all persons from immediate area of fire.

Prevent heating of the battery, charging the battery, discharge to predetermined limit, do not crush, disassemble, incinerate or short circuit.

SECTION 9- PHYSICAL AND CHEMICAL CHARACTERISTICS

TASTE	Not Available
SPECIFIC GRAVITY (GR/CC)	If leaking, Sulfuryl Chloride SG is 1.7 (water =1)
BOILING POINT (760 mm Hg)	If leaking, Sulfuryl Chloride boiling point is 69°C
MELTING POINT	If leaking, Sulfuryl Chloride melting point is -54°C
VAPOR PRESSURE (mm Hg, 20ºC)	If leaking, Sulfuryl Chloride vapor pressure is 100 mm
VAPOR DENSITY	If leaking, sulfuryl Chloride vapor density is 4.6 (air=1)
VOLATILITY	No Data
PHYSICAL STATE	Solid
SOLUBILITY AND REACTIVITY IN WATER	If leaking, Sulfuryl Chloride reacts with water into sulfuric acid, hydrochloric acid and chlorine. Water reacts with lithium to release Hydrogen.

PH (1% solution in water)	If leaking, sulfuryl chloride reacts violently with water.
APPEARANCE	Geometric Solid Object. If leaking yellow liquid.
ODOR	If leaking, gives off pungent corrosive odor

SECTION 10- STABILITY AND REACTIVITY

STABILITY: Stable

INCOMPATIBILITY**:** Extremely reactive with strong acids, water and alkali solutions.

HAZARDOUS POLYMERIZATION: Will not occur

HAZARDOUS DECOMPOSITION PRODUCTS:

1. Reaction of lithium with water: Hydrogen (H_2), Lithium hydroxide (LiOH).
2. Thermal decomposition over 150ºC: Sulfur oxides, (SO_2, SO_3), Sulfur chlorides (SCl_2, S_2Cl_2), Chlorine (Cl_2), Lithium oxide (Li_2O).
3. Electrolyte with water: Hydrogen Chloride (HCl) and SO_2

CONDITIONS TO AVOID: Avoid mechanical abuse, and electrical abuse such as short-circuit, overcharge, over-discharge, (voltage reversal) and heating

SECTION 11- TOXICOLOGICAL INFORMATION

THRESHOLD LIMIT VALUE (TLV) AND SOURCE: NA

ACUTE TOXICITY OF INTERNAL COMPONENTS:

Sulfuryl Chloride	LC50 inhalation, rat, 1 hour- 131-242 ppm	LD50- N/A
Thionyl Chloride	LC50 inhalation, rat, 1 hour- 500 ppm	LD50- N/A

HEALTH HAZARD ACUTE AND CHRONIC: Inhalation, skin contact, eye contact and ingestion are not likely by exposure to sealed battery.

Internal components of cell (mainly, Sulfuryl Chloride and Thionyl chloride) have a corrosive effect on the skin and mucous membranes.

Risk Phrases for Sulfuryl Chloride are: R14, R23, R24, R25, R34 and R37

Safety Phrases for Sulfuryl Chloride are: S26, S36, S37, S39 and S45.

SECTION 12- ECOLOGICAL INFORMATION

When properly used and disposed the battery does not present environmental hazard.

The internal components should not enter marine environment. Avoid release to waterways, wastewater or ground water.

SECTION 13- DISPOSAL CONSIDERATIONS

Disposal must be done by a certified hazardous waste disposal facility, according to the applicable regulations in every country and state.

Incineration should never be performed by battery users.

Battery recycling shall be done in authorized facility.

SECTION 14- TRANSPORTATION /SHIPPING

Proper Shipping Name- “Lithium batteries”

UN number for lithium batteries is 3090, Class 9 (miscellaneous) and 3091, Class 9 for lithium batteries in equipment.

Packing Group- II

Shipping requirements-US DOT: US requirements and exemptions are in accord with Code of Federal Regulations (CFR) 49 Chapter 1, paragraph 173.185.

Shipping requirements in aircrafts- are given by the IATA and ICAO requirements in Special Provision A45.

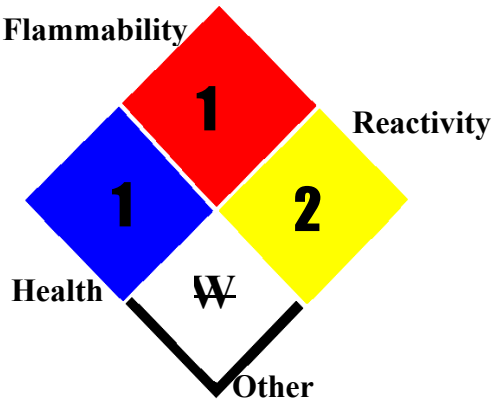
A list of Tadiran batteries and cells that are subject to transport regulations and those that are exempted can be obtained from Tadiran Batteries Ltd.

Identification and labeling in compliance with the applicable regulations should include the battery title, nominal voltage, lot number and warning.

SECTION 15- REGULATORY INFORMATION

Cells and batteries are defined as "articles" and thus are exempt from the requirements of the Hazard Communication Standard". The internal components (Sulfuryl Chloride and Thionyl Chloride) are hazardous under the criteria of the Federal OHSA Hazard Communication Standard 29 CFR 1920.1200.

NFPA rating- Lithium batteries are not included in the NFPA material list. Below is the NFPA rating for lithium metal. Lithium metal is an internal component, enclosed by hermetically sealed metallic can. Under normal application is not exposed.



SECTION 16- OTHER INFORMATION/DISCLAIMER

The information and the recommendations set forth are made in good faith and believed to be accurate at the date of preparation. The present file refers to normal use of the product in question. Tadiran Batteries makes no warranty expressed or implied.